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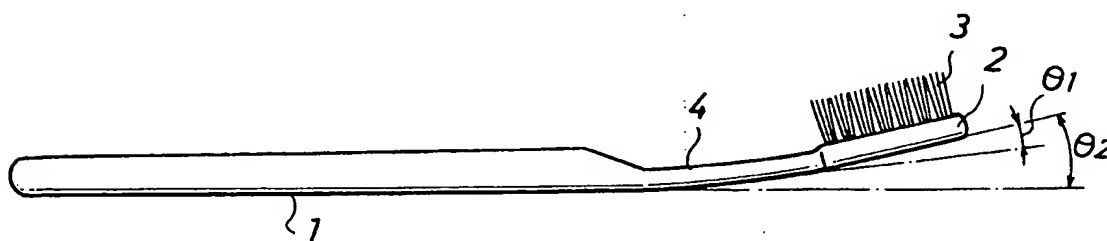
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54 Toothbrush.

57 A toothbrush has a grip portion (1), and a head portion (2) integrally connected with the grip portion (1) through a neck portion (4) and having bristles implanted therein (3). The neck portion (4) is bent or curved toward the bristles side relative to the grip portion (1). The head portion (2) is further bent or curved toward the bristles side relative to the neck portion (4).

In a further embodiment the heights of bristles (15a) implanted in a distal area (12a) of the head portion (2) are set shorter than those in the remaining area. The average position of the tips of each tuft (15, 16) are even across the whole head portion (2). The lengths of bristles within any one tuft (15, 16) may also be varied. The tips of the bristles may also be rounded.

Fig .1



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BACKGROUND OF THE INVENTION

[Field of the Invention]

5 This invention relates to a toothbrush, and particularly to a toothbrush capable of sufficiently brushing its user's teeth up to the innermost molars.

[Description of the Prior Art]

10 Heretofore, various toothbrushes have been known, such as those in which a grip portion and a head portion with bristles implanted therein are arranged in alignment, those in which a head portion with bristles implanted therein is bent or curved relative to a grip portion, and the like.

However, in the toothbrushes in which the head portion and the grip portion are in alignment, there is the fear that when the cheek and tongue sides of the molar teeth are brushed, insertion of the toothbrush is interfered by the cheek, front teeth, tongue, etc. Therefore, the users of toothbrushes, particularly those who
15 are not yet good at using a toothbrush, were frequently obliged to stop brushing the molar teeth before they have been sufficiently cleaned.

Even in the case of toothbrushes in which the head portion with bristles implanted therein are bent or curved relative to the grip portion, although the insertion of the toothbrush becomes more or less easier,
20 there is the fear that when the molar teeth are brushed, the insertion of the toothbrushes is interfered by the cheek.

Further, in the conventional toothbrushes, because the heights of the bristles are arranged to be generally equal to each other, the toothbrushes hardly reach the inner part of the user's buccal cavity and therefore, it was difficult to sufficiently brush the teeth up to the innermost molars. In view of this
25 inconvenience, there is proposed a toothbrush in which the heights of the bristles implanted in the distal area of the head portion are set shorter than the heights of the bristles implanted in the grip side area of the head portion (see Japanese Utility Model Early Laid-open Publication No. Sho 56-67173 and Japanese Utility Model Early Laid-open Publication No. Sho 56-171728, etc.)

However, in the above toothbrush, since the bristles implanted in the distal area of the head portion are
30 merely set short in height, it sometimes happened depending on the user's way of brushing that the toothbrush does not reach sufficiently up to the innermost molars, thus resulting in insufficient brushing of the innermost molars. Where the heights of the bristles are set short, so that the toothbrush may reach up to the innermost molars, the flexibility of the bristles is degraded.

35 SUMMARY OF THE INVENTION

A general object of the present invention is to provide a toothbrush capable of sufficiently brushing the teeth up to the innermost molars.

A concrete object of the invention is to provide a toothbrush, in which a head portion with bristles
40 implanted therein can be smoothly inserted into the user's buccal cavity up to the molar teeth when the teeth are brushed.

Another concrete object of the invention is to provide a toothbrush, in which the flexibility of bristles implanted in a distal area of its head portion is not degraded and the bristles can reach the innermost molars so as not to leave the innermost molars in insufficiently brushed states and so as to sufficiently
45 brush the teeth up to the innermost molars.

According to the present invention, the above objects can be achieved by a toothbrush including a grip portion, and a head portion integrally connected with said grip portion through a neck portion and having bristles implanted therein, said head portion being bent or curved toward the bristles side relative to said grip portion, said tooth brush being characterized in that said head portion is further bent or curved toward
50 the bristles side relative to said neck portion.

The above objects can also be achieved by a toothbrush, in which the heights of bristles implanted in the distal area of said head portion is shorter than the heights of bristles implanted in the remaining area of said head portion, the average positions of the tips of the bristles in each bristle flock implanted in said distal area being generally flushed with the average positions of the tips of the bristles in each bristle flock
55 implanted in said remaining area, the difference in length between the highest bristle and the lowest bristle in each bristle flock implanted in said distal area being set within a range of from 0.8mm to 4mm and the lengths of the bristles in each bristle flock being irregularly set.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view showing a first embodiment of a toothbrush of the present invention.

Fig. 2 is a side view showing a second embodiment of a toothbrush of the present invention.

5 Fig. 3 is a side view of an exploded state showing a third embodiment of a toothbrush of the present invention.

Fig. 4 is a partly enlarged side view showing one example of a head portion with bristles implanted therein of a toothbrush of the present invention.

10 Fig. 5 is a partly enlarged side view showing another example of the head portion of a toothbrush of the present invention.

Fig. 6 is a partly enlarged side view showing a further example of the head portion of a toothbrush of the present invention.

Fig. 7 is a partly enlarged side view showing a still further example of a head portion of a toothbrush of the present invention.

15 Fig. 8 is a partly enlarged side view showing a yet further example of a head portion of a toothbrush of the present invention.

Fig. 9 is a partly enlarged side view showing additional example of the head portion of a toothbrush of the present invention.

20 DETAILED DESCRIPTION OF THE EMBODIMENT

One embodiment of the present invention will be described hereinafter with reference to the accompanying drawings.

25 (First Embodiment)

Fig. 1 is a side view showing the first embodiment of a toothbrush of the present invention.

The toothbrush of this embodiment comprises a grip portion 1, and a head portion 2 with bristles 3 implanted in one surface thereof and integrally connected with the grip portion through a neck portion 4.

30 The head portion 2 is bent or curved toward the bristles side relative to the grip portion 1, and the head portion 2 is also bent toward the head portion side, on which the bristles are provided, relative to the neck portion 4.

The length of the head portion 2 is preferably set within a range of from 10mm to 25mm and more preferably within a range of from 12mm to 22mm within the aforementioned range. If the length of the head portion 2 is less than 10mm, there is the fear that the implanting area becomes too small and the brushing efficiency becomes unsatisfactory. On the other hand, if it exceeds 25mm, there is the fear that the tongue sides of the molar teeth become difficult to be brushed.

40 The angle θ_1 of bend of the head portion 2 relative to the neck portion 4 is preferably set within a range of from 5° to 15° and more preferably within a range of from 6° to 10° within the aforementioned range. If the angle θ_1 is less than 5° , there is the fear that the toothbrush is interfered by the cheek when the molar teeth are brushed. On the other hand, if it exceeds 15° , the brushing operation itself becomes difficult to effect.

Further, the angle θ_2 (total angle θ_2 including the angle θ_1) of bend or curve relative to the grip portion 1 of the head portion 1 is preferably set within a range from 7° to 30° and more preferably within a range of from 10° to 20° within the aforementioned range. If the angle θ_2 is less than 7° , there are fears that the efficiency for removing the plaque on the molar teeth becomes low and the brushing operation particularly for the molar teeth becomes difficult to effect. On the other hand, if the angle θ_2 of bend or curve exceeds 30° , there are also the fears that the efficiency for removing the plaque on the molar teeth becomes low and the brushing operation particularly for the molar teeth becomes difficult to effect.

50 The materials composing the grip portion 1 and the head portion 2 are not particularly limited but those which are normally used for toothbrushes are good enough. For example, it may be composed of AS (acrylonitrile-styrene resin), ABS (acrylonitrile-butadiene-styrene resin), PP (polypropylene resin), PC (polycarbonate resin), PBT (polybutyleneterephthalate resin), propionate, thermoplastic elastomer, etc.

The materials composing the bristles 3 are not limited, either. Those which are used for bristles of 55 conventional toothbrushes can be used.

The tip of each bristle may be formed in a rounded shape.

According to a toothbrush of this embodiment with the above-mentioned constitution, even a beginner of brushing exercise of a toothbrush can easily insert the head portion 2 into the inner side of the buccal

cavity in order to sufficiently brush the cheek and tongue sides of the molar teeth.

Therefore, there is no fear that the molar teeth are left non-brushed and plaque on the molar teeth can be sufficiently removed.

The Table-1 to follow shows the data obtained through a questionnaire about the easiness of the use of the toothbrush according to the first embodiment when the angle θ_1 of bend or curve is set to 5° , 10° and 15° and the other angle θ_2 of bend or curve is set to 10° , 20° and 30° . Similarly, the Table-2 shows the results of removal of artificial plaque under the above-mentioned angles of bend or curve.

For comparison purpose, there are also shown in the Table-1 and Table-2 the data obtained through a questionnaire on the conventional toothbrushes and the results of removal of artificial plaque thereof, wherein the head portion and neck portion are formed straight so that they are aligned on a same line and the head and neck portions are inclined by 10° , 20° and 30° relative to the grip portion.

Table-1 n=100

θ_1	5°	5°	5°	10°	10°	10°	15°	15°	0°	0°	0°
θ_2	10°	20°	30°	10°	20°	30°	20°	30°	10°	20°	30°
Easiness of brushing when front teeth are being brushed (%)	57	42	30	62	50	31	47	36	54	36	29
Easiness of brushing when molar teeth are being brushed (%)	72	87	68	64	84	70	76	80	61	68	65

Table-2

θ_1	5°	5°	5°	10°	10°	10°	15°	15°	0°	0°	0°
θ_2	10°	20°	30°	10°	20°	30°	20°	30°	10°	20°	30°
Ratio of artificial plaque removal (%) (n=5)	62.1	71.5	58.0	59.4	76.2	63.7	72.6	59.4	58.6	69.2	55.7
	± 4.6	± 2.9	± 3.2	± 5.0	± 3.9	± 4.5	± 6.1	± 3.4	± 3.8	± 5.0	± 2.9

As apparent from the above Table-1 and Table-2, in the case of the conventional toothbrushes, in which the head and neck portions are formed straight so that they are aligned on a same line and the head and

neck portions are inclined relative to the grip portion, the head portion was interfered by the cheek, etc. and difficulty was encountered during the brushing operation.

On the other hand, if the head portion 2 is bent relative to the neck portion 4 as in the first embodiment, the ratio of removing artificial plaque was increased, the brushing operation was carried out with ease, and operation performance was enhanced.

(Second Embodiment)

Fig. 2 is a side view showing the second embodiment of a toothbrush of the present invention. Like parts of Fig. 1 are denoted by like numerals and description thereof is omitted.

In the toothbrush shown in this second embodiment, the neck portion 4 is inclined such that its nearer part 4a to the grip portion 1 is once curved downward relative to the center line l of the grip portion 1 and then the remaining part of the neck portion 4 is raised up to a position above the center line l .

By virtue of the foregoing arrangement, in addition to the same effect available as in the first embodiment, there can be obtained such effect as that even in the case of the angle θ_2 of bend or curve being set near to 30° , there is no fear that the height of the toothbrush from the grip portion 1 to the distal end of the head portion 2 becomes too high.

(Other Embodiments)

A toothbrush of the present invention is not limited to those in which the head portion 2 is integrally formed with the grip portion 1 as shown in the first and second embodiments.

For example, it may be applied to the one as shown in the third embodiment in which a neck portion 4 and a head portion 2 are removably attached to a grip portion 1 of an electric toothbrush in which a driving source such as a motor 6, etc. is built in the grip portion 1. In Fig. 3, the numeral 7 denotes a vibrator adapted to incur vibration to the head portion 2 and to interconnect the grip portion 1 and the neck portion 4, and the symbolic numeral 4b denotes a recess formed in one end face of the neck portion 4 into which the vibrator 7 is removably engaged.

The present invention may also be applied to a toothbrush of the type in that a head portion 2 and a neck portion 4 are collapsibly connected to a grip portion 1 through a pin.

(Embodiments of a head portion of a toothbrush)

A toothbrush of the present invention including those of the first, second and other embodiments, becomes more favorable by constituting the head portion in a particular way. Accordingly, the head portions to be described hereinafter can be employed as the head portions in the first, second and other embodiments which are already described above.

Several embodiments of a head portion of a toothbrush will be described with reference to Figs. 4 through 9. In Figs. 4 through 9, different reference numerals are used even for identical or similar parts of Figs. 1 through 3.

In the toothbrush of the embodiment shown in Fig. 4, the heights of bristles 15a implanted in a distal area 12a of a head portion 12 are set shorter than the heights of bristles 16a implanted in the remaining area (the neck portion 14 side area of the head portion 12, hereinafter referred to as the "basal area" 12b) of the head portion 12, the average positions of the tips of the bristles in each bristle flock 15 implanted in the distal area 12a is generally flushed with the average positions of the tips of the bristles in each bristle flock 16 implanted in the basal area 12b, the difference in length between the highest bristle 15a and the lowest bristle 15a in each bristle flock 15 implanted in distal area 12a is set within a range of from 1mm to 4mm and preferably within a range of from 1.0mm to 2.0mm, and the lengths of the bristles 15a in each bristle flock 15 are irregularly set. The distal area 12a is formed such that it rises up to form a step relative to the basal area 12b. The flocks 15 and 16 of the bristles 15a and 16a each comprises a plurality (for example, 30 to 60) of bristles 15a and 16a, respectively, which are implanted in the head portion 12.

The reason why the difference in length between the highest bristle 15a and the lowest bristle 15a in each bristle flock 15 implanted in the distal area 12a is set within a range of from 1mm to 4mm and the lengths of bristles 15 in each bristle flock 15 are irregularly set within the aforementioned range, are as follows. That is, if the lengths of bristles 15 in each bristle flock are irregularly set in a range shorter than 1mm, it becomes almost the same to the one in which the heights of bristles implanted in the distal area 12a of the head portion 12 are merely set short, and on the other hand, if the lengths are irregularly set within a range longer than 4mm, the shortest bristle 15a among the bristles 15a of each bristle flock 15

becomes unable to reach the innermost molars, the gum portion, etc.

Further, the lengths of the bristles 16a in each bristle flock implanted in the basal area 12b are preferably irregularly set as in the lengths of the bristles 15a of each bristle flock implanted in the distal area 12a. Furthermore, the average heights of the bristles 15a implanted in the distal area 12a are set 5 10mm or less, and preferably within a range of from 8mm to 9mm, and have a difference of 0.5mm or more and preferably within a range of from 1mm to 2mm relative to the average heights of the bristles 16a implanted in the basal area 12b.

Moreover, the tip of each bristle 15a, 16a is preferably formed in a rounded shape. In this case, 50% or more of a plurality of bristles 15a, 16a adjacent to an optional bristle are arranged not to be contacted with the rounded tip 15b, 16b of the optional bristle (in other words, the heights of the bristles are arranged to be different). The reason why this arrangement is necessary is that if, in adjacent to the optional bristle, there are a plurality of bristles 15a, 16a having the heights equal to that of the optional one, the rounded tips 15b and 16b are contacted with each other and the tips of the bristles 15a and 16a are spread. In other words, the arrangement is made in order to avoid an occurrence of this unfavorable situation. The diameter of each 15 of the bristles 15a, 16a excepting the tips thereof is preferably set from 6/1000 to 15/1000 inches. If it is less than 6/1000 inches, the bristle 15a, 16a lacks stiffness and as a result, there is the fear that the force to be incurred to the teeth during the brushing operation is not effective as the force for removing the plaque and for massaging the gum portion. On the other hand, if it exceeds 15/1000 inches, the bristles 15, 16b themselves become too stiff and a feel to the gum portion becomes unfavorable. The diameters of the 20 rounded tips 15b, 16b of the bristles 15a, 15b are set larger by about 1.1 to 2.5 times the diameters of the remaining portions (the portions excepting the tips) of the bristles 15, 16a, and preferably by about 1.2 to 2.0 times. If they are less than 1.1 times, they are substantially unchanged from the conventional toothbrush in which the rounded tips 15b, 16b are not formed and the effects are insufficient. On the other hand, if they exceed 2.5 times, the tips of the bristles are spread, thus providing an unsatisfactory appearance. The 25 configuration of the rounded tips 15b, 16b are not necessarily limited to a rounded shape but it may be an elliptical shape, a nail shape, a cubic shape having four rounded corners, etc.

According to a tooth brush shown in Fig. 4, having the head portion constituted in the manner as mentioned above, the heights of the bristles 15a in the distal area 12a of the head portion 12 are set shorter than the heights of the bristles 16a in the basal area 12b of the head portion 12, the difference in length of 30 the longest and shortest bristles in each bristle flock 15 is set within a range of from 1mm to 4mm, and the lengths of the bristles 15a in each bristle flock are irregularly set within the aforementioned range. Accordingly, the bristles 15a do not become too stiff (lack of flexibility), the tips of the bristles 15a can easily enter between adjacent teeth where the plaque are difficult to be removed during the brushing operation, and the tip or tips of one or some of the bristles 15a in each bristle flock are readily contacted 35 even with the innermost molars, thus enabling to eliminate non-brushed teeth and to effectively remove the plaque. Further, since the rounded portion 15b, 16b is provided to the tip of each bristles 15a, 16a, the plaque, for example, between the enameled part of each tooth and the upper edge of the gum portion can be scratched out while massaging the gum portion. Furthermore, since the heights of the bristles 16a in the basal area 12b of the head portion 12 are set longer than the heights of the bristles 15a in the distal area 40 12a and the average positions of the tips of the bristles of the respective bristle flocks 15, 16 on the entire head portion 12 are substantially flushed with each other, a feel of the use is good.

The head portion of a toothbrush of the present invention may be constituted in the manner as shown, for example, in Figs. 3 through 7, besides that of the embodiment shown in Fig. 4.

To be specific, as is shown in Fig. 5, it may be designed such that no rounded portion is provided to the tip of each of the bristles 15a, 16a and the tips of only the bristles 12a in each bristle flock 15 in the 45 distal area 12a of the head portion 12 are irregularly set within a range of from 0.8mm to 4mm.

Further, as is shown in Fig. 6, the tips of only the bristles 15a in each bristle flock 15 in the distal area 12a of the head portion 12 are irregularly set within a range from 0.8mm to 4mm and the tips of the bristles 15a are provided with a rounded portion 15b, respectively.

Furthermore, as is shown in Fig. 7, it may also be designed such that the distal area 12a of the head 50 portion 12 is bent to provide a step portion between the distal area 12a and the basal area 12b and the average positions of the tips of the bristles in the respective bristle flocks 15, 16 on the entire head portion 12 are substantially flushed with each other.

Further, as is shown in Fig. 8, it may be designed such that the head portion 12 is divided into three 55 areas, namely, the distal area 12a, the basal area 12b and an intermediate area 12c and formed in three steps, and the average positions of the bristles of the respective bristle flocks 15, 16 are substantially flushed with each other.

Furthermore, as is shown in Fig. 9, it may also be designed such that the distal area 12a of the head

portion 12 is inclined and the average positions of the bristles in the respective bristle flocks on the entire head portion 12 are substantially flushed with each other. Further, it may be designed such that the heights of the bristles implanted in the distal area 12a of the head portion 12 are set shorter than the heights of the bristles 16a implanted in the basal area 12b of the head portion 12, the average positions of the bristles in the respective bristle flocks 15, 16 are substantially flushed with each other, the difference in length between the longest and the shortest bristles 15a in each bristle flock 15 in the distal area 12a is set within a range from 0.8mm to 4mm, and the lengths of the bristles 15a in each bristle flock 15 are irregularly set within the aforementioned range.

10 Claims

1. A toothbrush including a grip portion, and a head portion integrally connected with said grip portion through a neck portion and having bristles implanted therein, said head portion being bent or curved toward the bristles side relative to said grip portion, said tooth brush being characterized in that said head portion is further bent or curved toward the bristles side relative to said neck portion.
2. A toothbrush as claimed in claim 1, wherein the length of said head portion is set within a range from 10mm to 25mm, the angle of bend or curve of said head portion relative to said grip portion is set within a range of from 7° to 30°, and the angle of bend or curve of said head portion relative to said neck portion is set within a range of from 5° to 15°.
3. A toothbrush, in which the heights of bristles implanted in the distal area of said head portion is shorter than the heights of bristles implanted in the remaining area of said head portion, the average positions of the tips of the bristles in each bristle flock implanted in said distal area being generally flushed with the average positions of the tips of the bristles in each bristle flock implanted in said remaining area, the difference in length between the highest bristle and the lowest bristle in each bristle flock implanted in said distal area being set within a range of from 0.8mm to 4mm and the lengths of the bristles in each bristle flock being irregularly set.
4. A toothbrush as claimed in claim 3, wherein the difference between the average height of the bristles implanted in the distal area of said head portion and the average height of the bristles implanted in the remaining area of said head portion is 0.5mm or more, and the average height of the bristles in the distal area is 10mm or less.
5. A tooth brush as claimed in claim 1, 2, 3 or 4, wherein the tip of each bristle implanted in at least the distal area of said head portion is formed in a rounded shape.

Fig .1

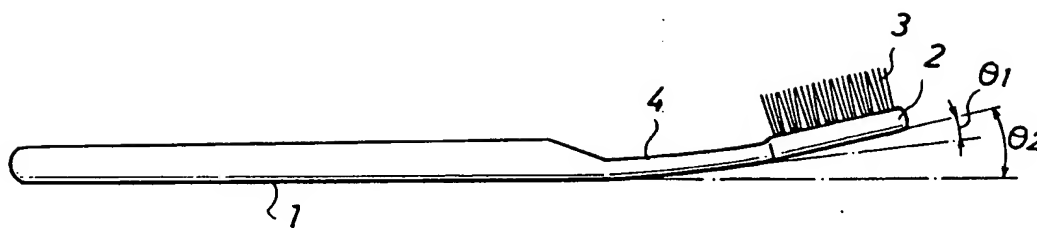


Fig .2

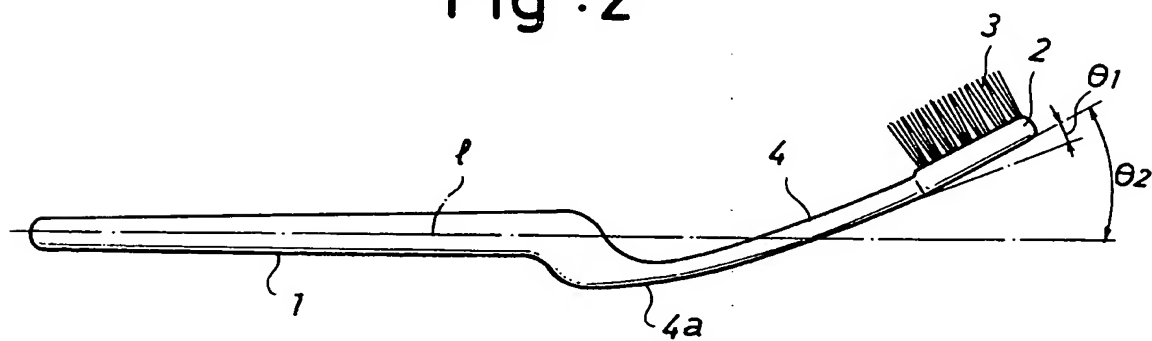


Fig .3

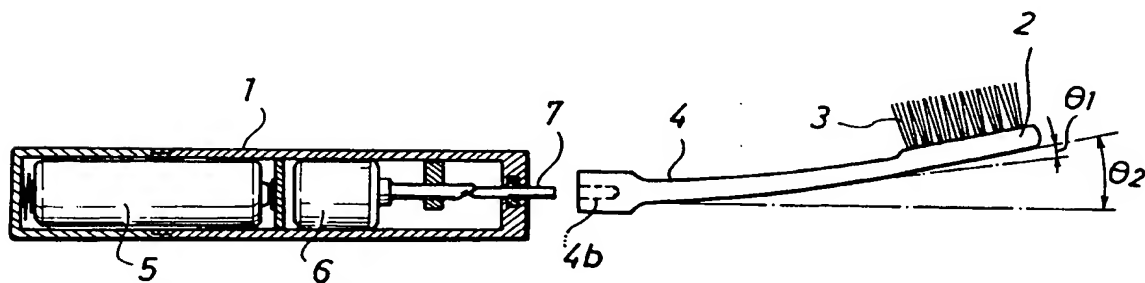


Fig .4

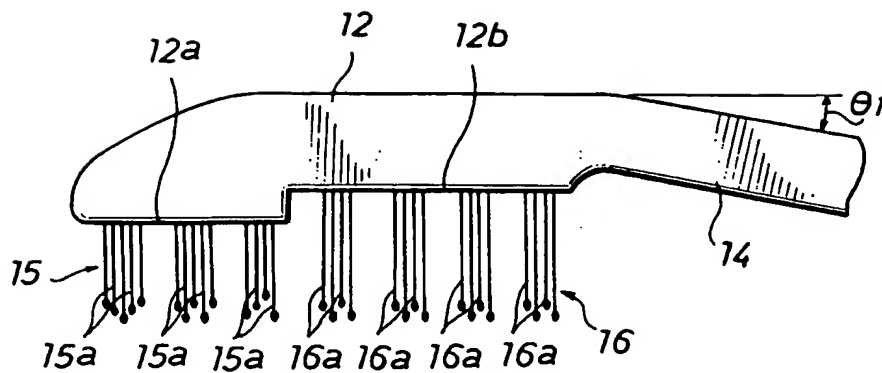


Fig .5

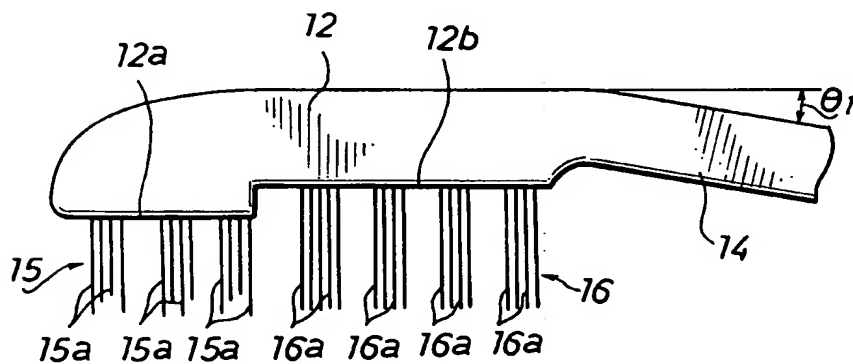


Fig .6

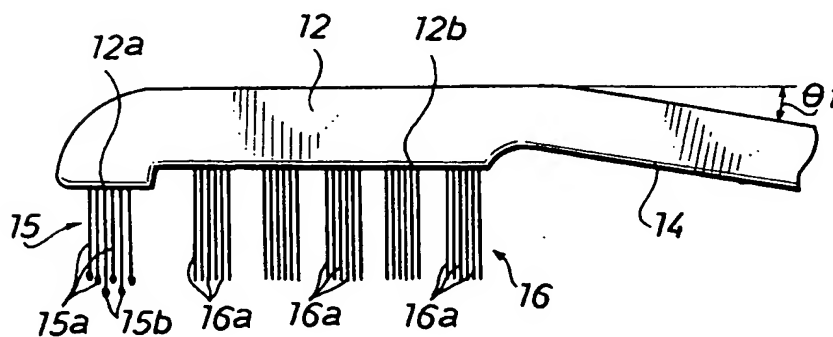


Fig .7

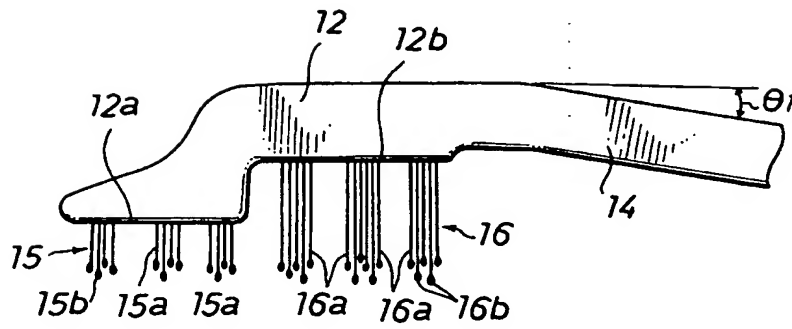


Fig .8

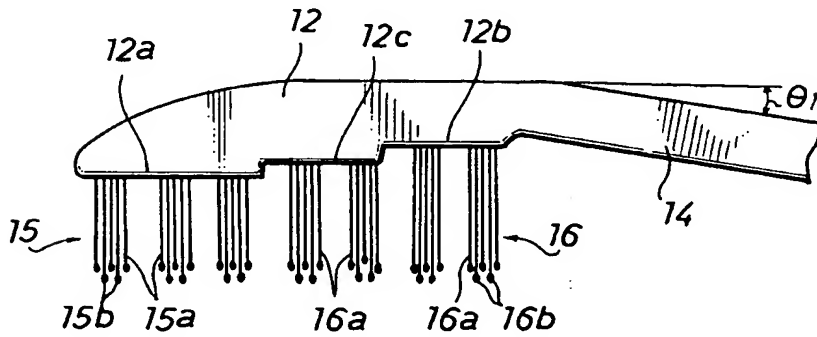


Fig .9

